Amendm nts to th Claims

1. (Original) A semiconductor processing method of cleaning a surface of a copper-containing material, comprising:

forming the copper-containing material over a semiconductor substrate; and

exposing the surface of the copper-containing material to an acidic mixture comprising Cl^-, NO_3^- and F^-.

2. (Original) The method of claim 1 wherein the copper-containing material consists essentially of copper.

3. (Original) The method of claim 1 wherein the mixture is an aqueous mixture comprising non-aqueous components, and wherein the non-aqueous components consist essentially of Cl^-, NO_3^-, F^-, at least until the exposing.

4. (Original) The method of claim 1 wherein the mixture is an aqueous mixture and wherein the only non-hydroxide anions in the mixture consist essentially of Cl^-, NO_3^- and F^-, at least until the exposing.

5. (Original) The method of claim 1 wherein the exposing occurs for a time of from about 30 seconds to about 1 hour.

6. (Original) The method of claim 1 wherein the exposing removes one or more of a copper oxide, a silicon oxide and a copper fluoride from on the surface.

7. (Original) The method of claim 1 wherein the exposing occurs at a temperature of from about 10°C to about 40°C.

8. (Currently amended) A method of cleaning a surface of a copper-containing material, comprising:

forming a ~~the~~ copper-containing material over a semiconductor substrate; ~~and~~

forming a second material over the copper-containing material;

etching an opening through the second material to expose a surface of the copper-containing material at the base of the opening; and

exposing the surface of the copper-containing material to a cleaning solution formed from hydrochloric acid, nitric acid and hydrofluoric acid, the exposing removing less than 5 Angstroms of the second material from sidewalls of the opening.

9. (Original) The method of claim 8 wherein the cleaning solution consists essentially of Cl^-, $NO3^-$, F^- and equilibrium components of H_3O^+ and H_2O, at least until the exposing.

10. (Original) The method of claim 8 wherein the mixture is an aqueous mixture and wherein the only non-hydroxide anions in the cleaning solution consist essentially of Cl^-, NO_3^- and F^-, at least until the exposing.

11. (Original) The method of claim 8 further comprising, before the exposing, forming the cleaning solution by combining an HCl solution (36%, by weight in water), an HF solution (49%, by weight in water), an HNO_3 solution (70%, by weight in water) and H_2O; the relative amounts of the combined H_2O and solutions being:

from about 2.5 parts H_2O per 1 part HCl solution to about 10 parts H_2O per 1 part HCl solution;

from about 75 parts H_2O per 1 part HNO_3 solution to about 300 parts H_2O per 1 part HNO_3 solution; and

from about 150 parts H_2O per 1 part HF solution to about 600 parts H_2O per 1 part HF solution.

12. (Original) The method of claim 8 further comprising, before the exposing, forming the cleaning solution by combining H_2O with solutions of HCl (36%, by weight in water), HF (49%, by weight in water) and HNO_3 (70%, by weight in water); the relative amounts of the combined H_2O and solutions being about 300 parts H_2O; about 60 parts of the HCl solution; about 2 parts of the HNO_3 solution; and about 1 part of the HF solution.

13. (Original) The method of claim 8 wherein the exposing removes one or more of a copper oxide and a copper fluoride from on the surface.

14. (Original) A semiconductor processing method of forming an opening to a copper-containing substrate, comprising:

providing a copper-containing substrate having a mass thereover, the mass comprising at least one of a silicon nitride and a silicon oxide, the copper-containing substrate being supported by a semiconductor material;

etching an opening through the mass and to the copper-containing substrate, a surface of the copper-containing substrate forming a base of the opening and thus defining a base surface of the opening, said base surface being at least partially covered by at least one of a copper oxide, a silicon oxide or a copper fluoride; and

cleaning said base surface with an acidic mixture comprising Cl^-, NO_3^- and F^- to remove at least some of the at least one of a copper oxide, a silicon oxide or a copper fluoride from the base surface.

15. (Original) The method of claim 14 wherein the mass comprises at least two layers stacked atop one another, one of the at least two layers comprising the silicon oxide and the other of the at least two layers comprising the silicon nitride; and wherein the opening is etched through both of the at least two layers.

16. (Original) The method of claim 14 wherein the base surface is at least partially covered by copper oxide, silicon oxide and copper fluoride; and wherein the cleaning removes substantially all of the copper oxide, silicon oxide and copper fluoride from the base surface of the copper-containing substrate.

17. (Original) The method of claim 14 wherein the copper-containing substrate consists essentially of elemental copper.

18. (Original) The method of claim 14 wherein the mixture is an aqueous mixture comprising non-aqueous components, and wherein the non-aqueous components consist essentially of Cl^-, NO_3^-, F^-, at least until the exposing.

19. (Original) The method of claim 14 wherein the mixture is an aqueous mixture and wherein the only non-hydroxide anions in the mixture consist essentially of Cl^-, NO_3^- and F^-, at least until the exposing.

20. (Original) A semiconductor processing method of forming an opening to a copper-containing substrate, comprising:

providing a copper-containing substrate having a mass thereover, the mass comprising at least one of a silicon nitride and a silicon oxide, the copper-containing substrate being supported by a semiconductor material;

etching an opening through the mass and to the copper-containing substrate, a surface of the copper-containing substrate forming a base of the opening and thus defining a base surface of the opening, said base surface being at least partially covered by at least one of a copper oxide, a silicon oxide or a copper fluoride; and

cleaning said base surface with a cleaning solution formed from hydrochloric acid, nitric acid and hydrofluoric acid to remove at least some of the at least one of a copper oxide, a silicon oxide or a copper fluoride from the base surface.

21. (Original) The method of claim 20 wherein the mass comprises at least two layers stacked atop one another, one of the at least two layers comprising the silicon oxide and the other of the at least two layers comprising the silicon nitride; and wherein the opening is etched through both of the at least two layers.

22. (Original) The method of claim 20 wherein the base surface is at least partially covered by copper oxide, silicon oxide and copper fluoride; and wherein the cleaning removes substantially all of the copper oxide, silicon oxide and copper fluoride from the base surface of the copper-containing substrate.

23. (Original) The method of claim 20 wherein the copper-containing substrate consists essentially of elemental copper.

24. (Original) The method of claim 20 wherein the cleaning solution consists essentially of Cl^-, NO_3^-, F^- and equilibrium forms of H_3O^+ and H_2O, at least until the exposing.

25. (Original) The method of claim 20 wherein the mixture is an aqueous mixture and wherein the only non-hydroxide anions in the cleaning solution consist essentially of Cl^-, NO_3^- and F^-, at least until the exposing.

26. (Original) The method of claim 20 further comprising, before the exposing, forming the cleaning solution by combining an HCl solution (36%, by weight in water), an HF solution (49%, by weight in water), an HNO_3 solution (70%, by weight in water) and H_2O; the relative amounts of the combined solutions and H_2O being:

from about 2.5 parts H_2O per 1 part HCl solution to about 10 parts H_2O per 1 part HCl solution;

from about 75 parts H_2O per 1 part HNO_3 solution to about 300 parts H_2O per 1 part HNO_3 solution; and

from about 150 parts H_2O per 1 part HF solution to about 600 parts H_2O per 1 part HF solution.